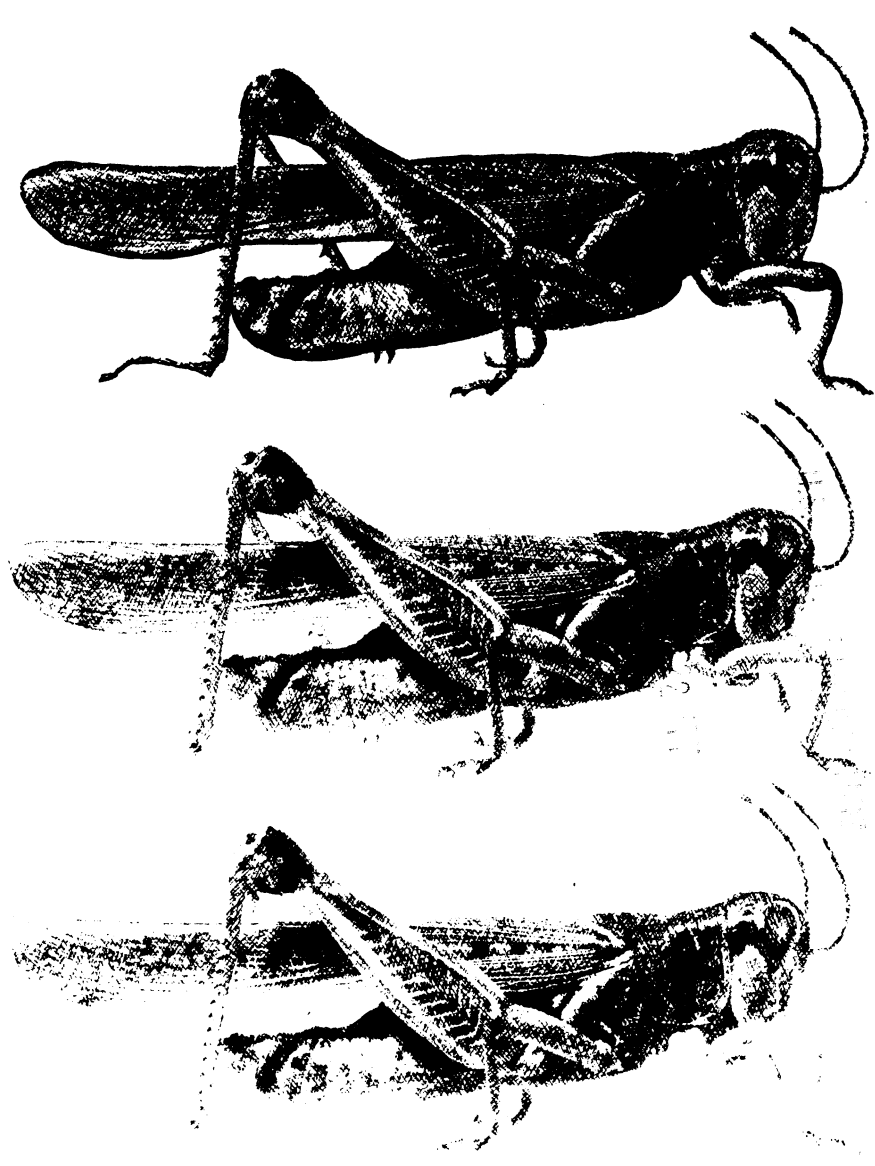


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Grasshopper Control



UNITED STATES
DEPARTMENT OF
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BULLETIN
NUMBER 2193

PREPARED BY
AGRICULTURAL
RESEARCH
SERVICE

CONTENTS

	Page
Selecting insecticides.....	1
Application procedures.....	2
Precautions	4
Cultural Practices.....	5
Tillage	5
Seeding	6
Other measures.....	8
Use of pesticides.....	9

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Grasshopper Control



Grasshoppers are found in every part of the United States, but serious outbreaks seldom develop east of the Mississippi River; they occur mostly in the western two-thirds of the country.

Grasshoppers often severely damage range grasses. Their feeding is one of the principal reasons for loss of productive grasslands in many of the Western States.

Many cultivated crops are also damaged by grasshoppers. When range grass is scarce and outbreaks are severe, grasshoppers often migrate into and severely damage the foliage of alfalfa, clover, corn, small grains, tobacco, sugarbeets, cotton, lettuce, potatoes, and fruit trees. In fruit orchards, grasshoppers sometimes completely strip the leaves and may kill young trees.

You can control grasshoppers by applying insecticides. If your farming practices will permit, cultural measures can be used to help keep grasshoppers in check.

SELECTING INSECTICIDES

Insecticides differ widely in their chemical properties. When selecting an insecticide, be sure that it is best suited for your needs.

Emulsifiable concentrates and wettable powders can be obtained in various strengths from insecticide dealers.

The emulsifiable concentrates or wettable powders should be mixed with a sufficient amount of water to insure that the spraying equipment will deliver the desired amount of active ingredient per acre.

Because of the wide geographical range of grasshoppers and the differences in the degree of infestation, the crops involved, and climate of infested areas, *only the names of the pesticides* are offered in this publication as a guide to help you solve your problems.

Specific dosages of the pesticide will be on the label or in the accom-

panying printed material. Assistance in interpreting the label directions may be obtained from your county agricultural agent or your Extension or State entomologists.

APPLICATION PROCEDURES

The recommended insecticides are most effective when applied evenly, at the right time, and in the right place. They may be applied with ground equipment or by aircraft.

Application equipment should be carefully adjusted to give the desired rate of output. Too much insecticide is wasteful, and it increases the danger of harmful residues. Too little insecticide is also wasteful because it will not prevent crop losses. Areas treated with less-than-effective dosages will need to be re-treated if control is to be obtained.

Determine the location of threatening infestations of young grasshoppers in relation to the location of your fields planted to crops. Look along roadsides, canal banks, and field margins, in idle areas bordering cultivated fields, and in the fields themselves.

Spray these places when the main hatch is completed or when the young grasshoppers begin to move off the hatching grounds. This early treatment will greatly reduce the amount of acreage that otherwise might have to be treated later. Grasshoppers that damage row crops usually hatch in field margins. Timely treatment of vegetation in these margins will destroy the pests before they move into the fields.

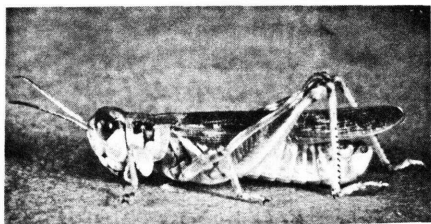
If a dosage range is given on the label, use the low dosage to kill young grasshoppers in short, dense, succulent vegetation and on open stands of taller growth where long-continued killing action is not essential.

Use up to the high dosages for sprays when vegetation is tall and dense, or when the grasshoppers are adults.

The high dosages may be needed also in the treatment of barrier strips, or for late-season use when vegetation is maturing, temperatures are high, and grasshoppers are fully grown.

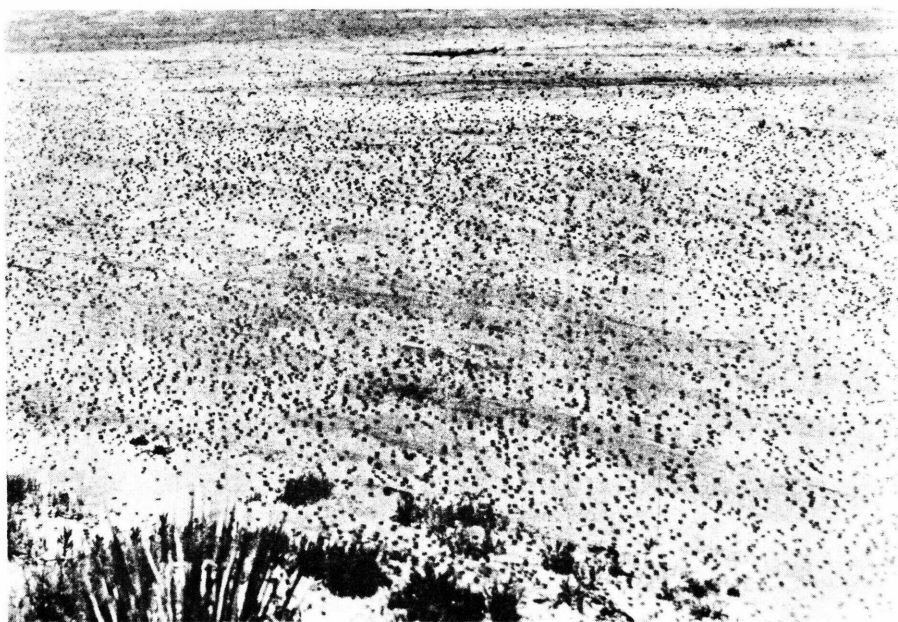
Alfalfa.—Use carbaryl, diazinon, malathion, methyl parathion, or mevinphos. When an entire field is severely infested, it usually is most economical to cut the alfalfa and then apply the insecticide to protect the next cutting. Spray field margins, ditchbanks, patches of weeds, and uncut strips of alfalfa where grasshoppers have concentrated.

Grasshoppers often hatch in large numbers after the first crop has been harvested. To control these insects, spray the next crop before the new growth is 6 inches high; this will protect the new growth.



BN-17623-X

The migratory grasshopper, "*Melanogaster sanguinipes*," probably the most widespread of all grasshopper species.



BN-17625-X

Grasshoppers sometimes gather in swarms and migrate hundreds of miles.

Clover.—Use carbaryl, diazinon, malathion, or mevinphos. Treat fields when grasshoppers are young. Carefully observe treated field and make second application if necessary.

Corn.—Use carbaryl, malathion, or toxaphene. To prevent damage to corn, spray margins of the field and other adjacent infested hatching areas when the grasshoppers are young and before migration starts.

Cotton.—Use carbaryl, malathion, methyl parathion, naled, or toxaphene. To protect cotton, spray nearby areas from which grasshoppers may migrate while the hoppers are small and before migration starts. If cotton plants become infested, spray as soon as you detect damage on the plants.

Grass, nongrazed.—Use carbaryl or malathion. Spray after hatching

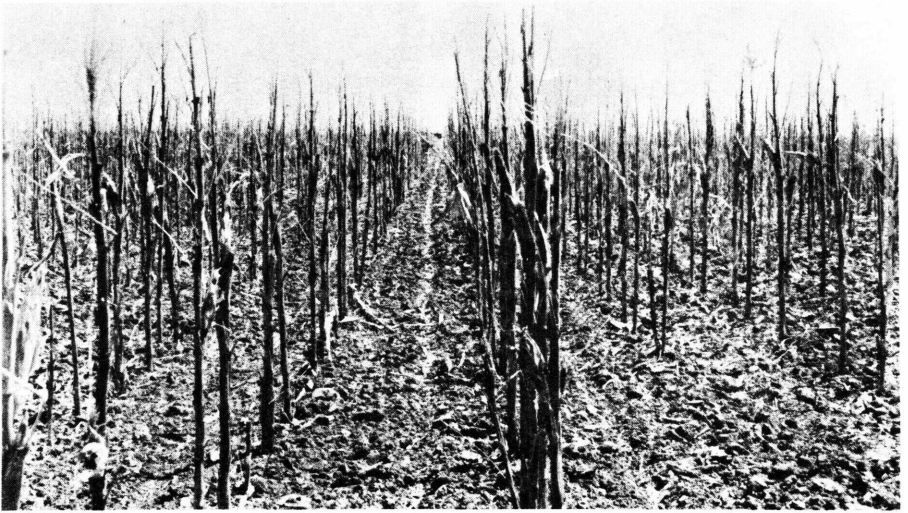
and before movement to cropland takes place.

Grass, range and pasture.—Use carbaryl, malathion, or methyl parathion. Begin treatment when young grasshoppers first appear and before eggs are laid.

Lettuce.—Use carbaryl or malathion. Apply carbaryl as a bait or malathion as a foliage spray when damage is first noticed.

Potato.—Use malathion or methyl parathion. Apply as a foliage spray when damage is first noticed.

Small grains (barley, oats, rye, and wheat).—Use malathion or toxaphene. To protect small grains, spray hatching areas when the nymphs first appear. To prevent damage to fall-seeded grain, spray the field margins and as far into the field as the grasshoppers have



Grasshopper damage to tall corn. In severe outbreaks, stalks may be eaten to the ground. BN-17622-X

moved. To protect the field margins, apply phorate granules at fall seeding of wheat to the outer two or three drills widths of the field.

Sugarbeets.—Use carbaryl or malathion or methyl parathion. Treat hatching areas, infested fence rows, idle land, and roadsides adjoining the field to destroy hoppers before they can move into the field. Carbaryl is registered for broadcast application as a bait. Malathion may be used as a spray on sugarbeets if needed.

Tobacco (plant beds or newly set plants).—Use malathion. Apply directly to plant bed and to soil around the margin of the bed. Treat field borders and nearby vegetation when hoppers are immature. Malathion sprays may be applied to the plants if warranted.

Tobacco (established plants in fields).—Use malathion or carbaryl. Treat the field borders and nearby

vegetation when hoppers are immature. Malathion sprays may be applied to tobacco if the degree of hopper damage warrants it.

PRECAUTIONS

Pesticides used improperly can be injurious to man, animals, and plants. *Follow the directions and heed all precautions on the labels.*

Application of carbaryl: Avoid any application during time of bloom or other increased bee activity. Prior to any application beekeepers within or near the area to be treated should be notified.

To reduce opportunity for damage to alfalfa, clover, and lettuce, do not apply when foliage is wet or when rain or excessive humidity is expected during the next 2 days.

Aerial application of carbaryl-oil suspensions is restricted to pro-

grams supervised by State or Federal agencies.

On head lettuce a 3-day interval between last application and harvest is necessary. On leaf lettuce the interval should be 14 days.

Application of diazinon: Do not spray livestock directly with either air or ground equipment. Do not cut for hay until 7 to 10 days after treatment—depending on the amount of diazinon applied per acre.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE.—Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State extension specialist to be sure the intended use is still registered.

CULTURAL PRACTICES

Grasshoppers, particularly those that lay their eggs in fields planted to crops, may be controlled to some extent by tillage and seeding operations and by other cultural measures. Use these measures only if they are consistent with approved farming practices in your community.

Cultural operations do not eliminate the need for insecticides, but they reduce the amount of chemicals needed and make their application easier.

Tillage

Working the soil kills grasshoppers in several ways. It can bury their eggs so deep that young grasshoppers do not hatch. It can bring the eggs to the surface where they are destroyed by the drying action of sun and wind. It is also a means of discouraging egg laying, preventing dispersal of the pests, and



Mist blower mounted on a truck for use in grasshopper control.

EPQ-1350

forcing grasshoppers scattered over a field to concentrate in a small area.

Proper tillage before eggs have hatched often gives excellent control of light or threatening grain-stubble infestations.

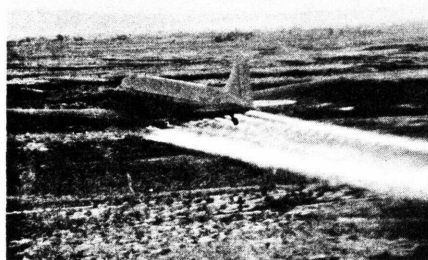
Fall tillage is preferable, but spring tillage sometimes is just as effective. Tillage right after harvest will make the soil unattractive to egg laying, and will assist in destroying eggs already laid.

In determining the time of tillage and the implement to use, consider not only grasshopper control but also the tillage effect on soil drift, weed control, and soil moisture.

Moldboard plowing, 5 or more inches deep, followed by packing, is the best method to prevent the emergence of young grasshoppers in areas where soils are heavy and soil blowing is not a problem.

Shallow cultivation is less effective than moldboard plowing, but it will destroy many of the eggs by exposing them to sun and wind. The one-way disk is the best implement for this operation. The duck-foot cultivator, the single or double harrow, and the one-way disk harrow are satisfactory. "Blade" tillers used in "stubble-mulch" farming are less effective than the others. Shallow cultivation is most effective during dry weather, when the egg-drying effects of sun and wind are greatest.

Grasshopper-infested grain stubble that is to be summer-fallowed should be worked before the eggs hatch. If tillage is delayed until after the young grasshoppers appear, it still can be used to prevent them from moving to nearby crops.



BN-29209

Applying spray by airplane.

This tillage can be accomplished by cultivating a guard strip 3 rods wide around the entire field. If the strip is kept cleanly fallowed, the young grasshoppers can usually be held within the field for a week or two. There may be time to complete tillage operations before they escape.

Tillage done after the establishment of the guard strip should start next to the strip and should extend until only a small block of unworked stubble remains in the center of the field. The grasshoppers will then be concentrated in this small area. They can be killed with insecticide at much less expense than would be required for spraying the entire field.

Do not plow or shallow-till large tracts of sod or idle land to control grasshoppers unless you intend to seed or summer-fallow the land immediately. Cultivation ruins such land for pasture and makes it subject to soil blowing.

Seeding

In years when grasshoppers are abundant, plant small grains only on fall- or spring-tilled land, or on

clean summer-fallowed land. Few grasshoppers emerge from such land.

Do not drill grain into heavily infested, unworked stubble. You will destroy only a few eggs by the seeding process. When the eggs hatch, the field will swarm with young grasshoppers. Immediate spraying of the entire field will then be necessary to save the crop.

Early spring seeding is important in reducing grasshopper damage. Early-seeded crops make considerable growth before grasshoppers hatch. They withstand a

longer period of feeding than late-seeded crops. They give you a better opportunity to kill the grasshoppers with chemicals.

When small grains are ripening, flying grasshoppers frequently congregate in late-seeded crops that are still green and succulent. Those crops are often severely damaged before the grasshoppers are noticed. Well-advanced crops are much less attractive to the pests. Barley, oats, and wheat that have headed can withstand considerable defoliation without serious reduction in yield of grain.



ST-444-7
Equipment used to load airplane for low-volume application of spray.

Other Measures

Insecticides and proper tillage and seeding are the best weapons for fighting grasshoppers, but occasionally you may be able to combat the pests in other ways.

Regrassing Field Margins

Weedy field margins, including roadsides and fence rows, contain more grasshopper eggs than other habitats. Replacing broad-leaved weeds with perennial grasses greatly reduces the number of grasshoppers in these locations. Crested wheatgrass can be used for this purpose. It is easily and quickly established and is less attractive for egg laying than native grasses.

Elimination of weeds and prevention of soil erosion are additional benefits of grassed field margins. Increased farm returns derived from

the grass grown along otherwise unproductive field margins may also be of some importance.

Immune Crops

Some of the sorghums such as sorgo and kafir, after reaching a height of 8 to 10 inches, are practically immune to grasshopper attack. They can be planted rather late in the season to provide valuable feed for livestock.

Irrigation

When alfalfa and other legumes are irrigated, large numbers of grasshoppers are sometimes driven to ditchbanks and other dry places where they can be killed with spray at slight expense. Flooding hay meadows where grasshopper eggs have recently hatched will destroy many of the young grasshoppers.

USE OF PESTICIDES

This publication is intended for nationwide distribution. Pesticides are registered by the Environmental Protection Agency (EPA) for countrywide use unless otherwise indicated on the label.

The use of pesticides is governed by the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended. This act is administered by EPA. According to the provisions of the act, "It shall be unlawful for any person to use any registered pesticide in a manner inconsistent with its labeling." (Section 12(a)(2)(G))

EPA has interpreted this Section of the Act to require that the intended use of the pesticide must be on the label of the pesticide being used or covered by a Pesticide Enforcement Policy Statement (PEPS) issued by EPA.

The optimum use of pesticides, both as to rate and frequency, may vary in different sections of the country. Users of this publication may also wish to consult their Cooperative Extension Service, State agricultural experiment stations, or county extension agents for information applicable to their localities.

The pesticides mentioned in this publication are available in several

different formulations that contain varying amounts of active ingredient. Because of this difference, the rates given in this publication refer to the amount of active ingredient, unless otherwise indicated. Users are reminded to convert the rate in the publication to the strength of the pesticide actually being used. For example, 1 pound of active ingredient equals 2 pounds of a 50 percent formulation.

The user is cautioned to read and follow all directions and precautions given on the label of the pesticide formulation being used.

Federal and State regulations require registration numbers. Use only pesticides that carry one of these registration numbers.

USDA publications that contain suggestions for the use of pesticides are normally revised at 2-year intervals. If your copy is more than 2 years old, contact your Cooperative Extension Service to determine the latest pesticide recommendations.

The pesticides mentioned in this publication were federally registered for the use indicated as of the issue of this publication. The user is cautioned to determine the directions on the label or labeling prior to use of the pesticide.

Reviewed by

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Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE

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